AMENDMENT TO THE RECORD OF DECISION
LOWRY LANDFILL SUPERFUND SITE

1.0 INTRODUCTION AND STATEMENT OF PURPOSE

The purpose of this document is to amend the Record of Decision (ROD) for the Lowry Landfill Superfund Site in Arapahoe County, Colorado (Site), issued by the U.S. Environmental Protection Agency (EPA) on March 10, 1994. The ROD Amendment is a result of EPA's consideration and response to new information received subsequent to the issuance of the ROD. This ROD Amendment fundamentally changes the remedy for the Former Tire Pile Area (FTPA) selected in the ROD. The sitewide remedy for the Site remains protective of human health and the environment.

EPA is the lead agency for overseeing the cleanup of the Site; the Colorado Department of Public Health and Environment (CDPHE) is the support agency.

This ROD Amendment provides a brief history of the Site, describes the remedy selected in the ROD highlighting the remedy for the FTPA waste pits, summarizes the information that prompted and supports a fundamental change to the remedy selected in the ROD, describes the modifications to the remedy for the FTPA waste pits, and compares the original and the modified remedies for the FTPA waste pits using the nine evaluation criteria for detailed analysis of alternatives required by the National Contingency Plan (NCP), 40 CFR Part 430. It also summarizes the support agency's and the public's comments on the modifications to the remedy.

The administrative record for this ROD Amendment, which contains this ROD Amendment and the information EPA relied upon to make its decision, is available for public review at the following location:

EPA Superfund Records Center
999 18th Street, 5th Floor, North Terrace
Denver, Colorado 80202
(303)312-6473
Hours: Monday through Friday, 8:00 am to 4:30 pm

This ROD Amendment and key documents from the administrative record are also available at the following Lowry Landfill Site information repository:

Aurora Public Library
14949 East Alameda Parkway
Aurora, Colorado 80012
(303)739-6600
Hours: Monday through Thursday, 9:00 am to 9:00 pm
Saturday, 9:00 am to 5:00 pm
Sunday, 12:30 pm – 6:00 pm

In fulfillment of EPA's public participation responsibilities under Section 117 (c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC Section 9601, et seq. (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and Section 300.435(c)(2)(i) of the NCP, EPA prepared a Proposed Plan which described the proposed modifications to the remedy for the FTPA waste pits and requested public comment. EPA distributed the Proposed Plan by mail to 2600 addressees in the surrounding community and made it available on the Lowry Landfill website maintained by EPA. In addition, EPA mailed a short fact sheet to an additional 3500 addressees in the surrounding community. The fact sheet described the proposed modifications and provided information on how to obtain a copy of the entire Proposed Plan. A notice of availability of the Proposed Plan was published in the Denver Post and the Rocky Mountain News on May 24, 2005. A public comment period was held from May 26, 2005 until June 27, 2005. During the public comment period, EPA accepted written comments by mail and electronic mail. Also during the public comment period, EPA conducted public meetings on June 8, 2005 and June 14, 2005 to present the Proposed Plan to a broad community audience and to provide an opportunity for interested community members to give oral comments.

The comments EPA received from the public were unanimously in support of the modifications to the remedy for the FTPA waste pits. A Responsiveness Summary can be found in Section 10 of this ROD Amendment.

2.0 SITE HISTORY

The approximately 507-acre Lowry Landfill Superfund Site is located near the intersection of Quincy Avenue and Gun Club Road in Arapahoe County, 15 miles southeast of the City and County of Denver and 2 miles east of Aurora, Colorado (Figure 1). The Denver Arapahoe Disposal Site, an operating municipal solid waste landfill northeast of the intersection of Gun Club Road and East Hampden Avenue, forms the northern boundary of the Site. The City and County of Denver (Denver) owns the Site.

From the mid-1960s until 1980, Denver operated a "co-disposal" landfill at the Site, accepting liquid and solid municipal and industrial wastes, including sewage sludge. These materials included hazardous substances, such as volatile organic compounds and heavy metals, pursuant to 40 CFR Section 302.4. The liquids were placed into 78 unlined trenches over approximately 200 acres, and then solids such as soil, old tires and household refuse were added to the trenches to absorb the liquids. The types of waste disposed at Lowry Landfill using this practice included industrial de-greasers, paint, pesticides, hospital and veterinary waste, metal-plating waste, petroleum products, sewage sludge, tires and household waste.

EPA estimates that approximately 138 million gallons of industrial wastes were disposed of at Lowry Landfill. Nearly all of these wastes were disposed in the southern half of the Site within the 200-acre main landfill. A much smaller volume of waste was placed north of the main landfill in ponds and waste pits. From 1969 until 1986, municipal sewage sludge was applied to approximately 160 acres along the northern and eastern boundaries of the Site. The sludge was applied to the surface of the land and then incorporated into

the native soils. After 1980, leachate collected in onsite surface impoundments was injected in the same 160-acre area. Both the municipal sewage sludge and the leachate contained hazardous substances pursuant to 40 CFR Section 302.4.

During the 1970s and 1980s, millions of tires had accumulated at the Site. The tires were laid on top of other waste that had been placed in three separate pits north of the main landfill, each approximately 20-30 feet deep. From 1989 through 1992, Denver and its contractors removed, shredded and consolidated the tires and placed the tire shreds in a monofill on the east side of the Site for potential future re-use as fuel. The area and three waste pits that lay under the tires became known as the Former Tire Pile Area.

In 1980, Denver stopped co-disposal practices. Landfill operations continued at the Site until 1990, but were restricted to disposal of municipal solid waste only. From 1980-1990, Waste Management of Colorado (WMC) operated the Lowry Landfill under a contract with Denver.

The waste disposed at Lowry Landfill contaminated the soils at the Site and eventually contaminated shallow groundwater. Additionally, gases from the buried wastes contaminated the air spaces in subsurface soil.

The Lowry Landfill was listed on the National Priorities List in 1984. From 1984 until 1993, a series of remedial investigations/feasibility studies were performed to study the nature and extent of contamination and to investigate the potential threats that the Site posed to human health and the environment.

In 1990, all municipal solid waste landfill operations stopped at the Site to allow environmental investigations to proceed without interference. The landfill operator, WMC, constructed a soil cover over the 200-acre main landfill in the southern part of the Site. The landfill cover is at least 4 feet thick and up to 12 feet in thickness in some places.

3.0 THE SITEWIDE REMEDY SELECTED BY EPA IN 1994

After investigating the contamination at the Site, evaluating the potential risk the Site posed to human health and the environment and considering alternative strategies for cleaning up the Site, EPA selected a remedy for the Site in 1994. The sitewide remedy is described in detail in the ROD signed by both EPA and CDPHE on March 10, 1994.

The sitewide remedy utilizes containment, collection, and treatment to address the contamination at the Site. The remedy requires a combination of engineered components to be constructed and operated to prevent offsite migration of contamination above performance standards. EPA established points of compliance, or compliance boundaries, for the landfill gas remedy and the groundwater remedy at locations inside the Site boundaries, illustrated on Figure 2. Most of the components of the sitewide remedy are currently in place and operating to achieve the remedial action objectives described in the 1994 ROD. The completed sitewide remedy components are described below and illustrated on Figure 2.

An 8,800-foot-long underground Groundwater Barrier Wall (described in the ROD as the "East/South/West Barrier Wall") of soil and clay encloses the west, south and east sides

of the main landfill in the southern part of the Site. The wall is below the ground surface, approximately 40 to 75 feet deep. The wall minimizes the flow of clean groundwater onto the Site from the south and west, and the flow of groundwater away from the Site to the east, reducing the volume of contaminated groundwater produced by contact with the wastes buried in the landfill.

The landfill cover is maintained as part of the plan selected in the ROD. The cover minimizes the amount of rainwater that can seep into the landfill, thus reducing the amount of groundwater that could become contaminated by contact with the wastes in the landfill. In 1999, 2 feet of additional soil cover were placed on the 29-acre north face of the landfill to provide a minimum cover thickness of 4 feet over the entire closed landfill area. In 2002, closed topographic depressions in the landfill cover were backfilled with clean fill and re-graded as required by the operations and maintenance plan for the landfill cover.

At the northern limit of the main landfill, a trench (described in the ROD as the "North Toe Extraction System") collects contaminated groundwater flowing north from the buried wastes. The groundwater collected in the trench is pumped to the water treatment plant located at the northern boundary of the Site.

At the intersection of the unnamed creek alluvial channel and the northern Site boundary, contaminated groundwater is captured in another system called the North Boundary Barrier Wall (NBBW). This 1,000-foot-long and 30-foot-deep clay wall provides a barrier to groundwater flow to the north. At the upstream side of the NBBW, a gravel bed allows collection and removal of migrating groundwater. Groundwater from the gravel bed is pumped to the water treatment plant. EPA evaluates the effectiveness of the NBBW in capturing groundwater on an ongoing basis.

Denver originally built an onsite water treatment plant in 1984. The plant has undergone several upgrades, most recently in 2004. Contaminated water collected from various areas of the Site is treated at the plant to a level safe for discharge into a sanitary sewer line. The discharged water eventually reaches the Metro Wastewater Reclamation District and Aurora's wastewater treatment facilities located offsite. The City of Aurora and the Metro Wastewater Reclamation District issued the industrial pretreatment discharge permit for the water treatment plant at the Site. The offsite facilities only accept water that complies with the terms of the Site industrial pre-treatment discharge permit.

North of the closed landfill area, contaminated groundwater is kept separate from clean surface water within the unnamed creek streambed by permeable material that has been placed in the streambed and covered with a clay layer. The permeable material provides a pathway for groundwater to flow to the north without contacting surface water. The top of the clay cover is now the streambed, allowing clean surface water to run off the surrounding Site areas and migrate to the north without coming into contact with contaminated groundwater flowing underneath the cover. This response action is known as the "Surface Water Removal Action".

A landfill gas collection system of 54 extraction wells was installed in the main landfill to remove and burn gases generated from the buried waste. All of the extracted gas is routed to an enclosed flare at the northern end of the Site where it is burned. Emissions from the

flare are monitored to ensure that they meet environmental standards and are safe for the surrounding community.

The selected remedy also requires institutional controls as an extra measure of protection from exposure to the wastes remaining at the Site. The City and County of Denver, Arapahoe County and the City of Aurora enacted institutional controls on land and groundwater usage. These institutional controls work to prevent people from coming into contact with the contaminated soil, water or landfill gas that remains on the Site. EPA and CDPHE have the authority to enforce the onsite institutional controls.

Long-term monitoring programs are in place to evaluate the effectiveness of the containment and collection systems, and the overall protectiveness of the sitewide remedy.

3.1 THE REMEDY FOR THE FORMER TIRE PILE AREA SELECTED IN THE 1994 ROD AND THE 1997 EXPLANATION OF SIGNIFICANT DIFFERENCES

The 1994 ROD selected removal of accessible solids in the FTPA through excavation, removal, and treatment, within the FTPA, of surface and subsurface drums, contaminated soils, and waste pits and reclamation of the FTPA. The ROD specified that the remedy for the FTPA shall achieve the following remedial action objectives (RAOs) for landfill solids:

- Protection of human health and the environment from direct contact or ingestion of landfill solids or soils intermingled with landfill solids containing contaminants;
- Protection of humans from inhalation of volatilized contaminants from landfill solids or soils intermingled with landfill solids, and inhalation of contaminated airborne matter from soils or landfill solids that exceed performance standards;
- Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill solids, to the saturated zone and groundwater;
- Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water;
- Prevention of off-site migration of landfill solids and soils intermingled with solids into other media;
- Protection of human health and the environment from direct contact with or ingestion of leachate that exceeds the performance standards for shallow groundwater and subsurface liquids; and
- Prevention of off-site migration of leachate or infiltration into other media.

The performance standards for the FTPA remedy were:

- Excavation activities in the FTPA area shall remove surface and subsurface drums, associated free liquids, and other visible contamination to the extent practicable. This shall include excavation of contaminated materials and soils in the waste pits in the FTPA.
- It is estimated there are approximately 10 surface and 1,350 buried drums containing approximately 1,300 gallons of liquid waste and that there are approximately 15,000 cubic yards of contaminated soil and debris in the area. The actual numbers may be different.
- "Visible" contamination shall include stained or discolored materials such as soil, construction debris, woody materials, and refuse; excavation "to the extent practicable" shall include the removal of visible contamination until undisturbed, competent, native bedrock is encountered.
- Contaminated materials in the FTPA shall be excavated and characterized for offsite treatment and disposal to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act and the Colorado Hazardous Waste Act.
- Maintenance of the landfill cap shall comply with the above ARARs.
- Liquids shall be treated offsite at a RCRA Subtitle C facility using incineration and ash stabilization, or other treatment method capable of similar performance.
- It is anticipated that solids and soils shall be treated using stabilization before disposal, but actual treatment methods shall be determined by EPA, in consultation with the Colorado Department of Health, during remedial design.
- The excavations shall be backfilled with clean soils.
- To meet the existing grade, a 2–foot-thick layer of clay soil shall be placed on top of the excavated areas as a cap. The clay shall be placed in lifts not exceeding 6 inches and compacted to a minimum of 95 percent relative density according to Standard Proctor (ASTM D698). A minimum 6-inch thick top soil layer shall be placed on top of the cap and shall be vegetated with a dryland pasture mix similar to that used on the main landfill mass to stabilize the cap surface and minimize soil and wind erosion.
- The remedy shall comply with all other performance standards (ARARs) identified in Table 11-1 of the 1994 ROD.

In 1997, EPA issued an Explanation of Significant Differences (ESD) that selected onsite treatment and disposal of contaminated materials excavated from the FTPA waste pits. This differed from the original selected remedy which specified offsite treatment and disposal of the contaminated materials excavated from the FTPA waste pits. In the ESD, EPA selected drying/controlled aeration as the method of onsite treatment. In order to dispose of these wastes onsite, the ESD specified that contaminated materials shall be treated to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act and the Colorado Hazardous Waste Act.

4.0 BASIS FOR THE ROD AMENDMENT

4.1 Implementation of the 1994 ROD and 1997 ESD

In 1995, EPA issued an Administrative Order for Remedial Design/Remedial Action, EPA Docket No. CERCLA VIII-95-05 (RD/RA Order). In 1995, the Respondents to the RD/RA Order (Respondents) completed field investigations to support remedial design of the remedy selected in the 1994 ROD (Parsons, 1996a). In 1998, the Respondents completed the final remedial design (Parsons, 1998).

The scope of the final remedial design included all three FTPA waste pits. The Respondents began remedial action excavation activities at the middle waste pit (MWP) in August 1998. The Respondents completed waste removal from the MWP on February 27, 1999. The total volume of waste removed from the middle pit was 14,236 bulk cubic yards (bcy), including 1,736 cy of debris. The waste included visibly contaminated soil, wood debris, paint sludge, gas cylinders, and municipal debris. The volume of visibly contaminated material removed from the MWP was approximately 300 percent greater than estimated in the final remedial design. Additionally, 170 drums were removed from the MWP. 80,000 gallons of liquid including non-aqueous phase liquid (NAPL) were removed and transported offsite for treatment and disposal (Parsons, 1999a).

During excavation of the northeastern quarter of the MWP, it was difficult to control emissions of volatile organic compounds (VOCs) using the approach specified in the final remedial design. During the final days of excavating the MWP, the Respondents determined that additional measures beyond those approved by EPA in the final remedial design would be necessary to control air emissions and odors during excavation at the north waste pit (NWP), scheduled to be performed next. The Respondents chose to utilize an enclosed structure with ventilation and emissions treatment systems to control emissions.

Prior to excavating the NWP, the Respondents constructed a large sprung structure over the NWP. During excavation of the NWP, ventilation and treatment of the air emissions was accomplished using a system consisting of a 12,000 cubic feet per minute blower and twin banks of activated carbon attached to the sprung structure.

Immediately upon excavation into the NWP in May, 1999, waste liquid was encountered beginning approximately six feet beneath the ground surface. The liquid was an oily sludge containing high concentrations of VOCs. Air monitoring conducted inside the containment structure immediately adjacent to the excavation measured sustained concentrations of total VOCs of several thousand parts per million (ppm). Peak concentrations of VOCs in air were measured in the 5,000 to 9,000 ppm range. These levels were of particular concern to health and safety given the fact that chlorinated VOCs have relatively low Immediate Danger to Life and Health (IDLH) values (e.g., 50 ppm for 1,2-dichloroethane, 150 ppm for tetrachloroethene), meaning that they can cause adverse human health effect at much lower air concentrations than were measured during the 1999 excavations. A mist of moisture and VOCs emanating from the liquids and saturated soils filled the containment structure. Even with the off-gas ventilation and

treatment system operating, the mist impaired worker visibility inside the structure. On the second day of excavation and blending, it was determined that VOC air concentrations and misting could not be effectively controlled, despite reductions in open-face working areas and application of vapor suppression material. While all workers inside the containment structure were wearing Occupational Safety & Health Administration (OSHA) Level B personnel protective equipment, there was an immediate threat to worker health and safety (Parsons, 1999b). As a result, the Respondents requested and EPA granted permission for the excavation to stop.

Excavation into the NWP was limited to an excavation approximately 12 feet wide by 15 feet long by 12 feet deep, located in the southwest corner of the waste pit. Key observations associated with the excavation include the following:

- Visibly contaminated material started approximately 4 feet below the leveled ground surface, and continued to approximately 12 feet below ground surface (bgs). Deeper excavation was not attempted because down to 12 feet, releases of fugitive VOCs and moisture (steam) could not be controlled using the measures in place.
- The upper 2/3 of the waste material (4 feet to 8 feet bgs) consisted of silty clayey soils stained with black, viscous oil. The oily material appeared bound to the soil, i.e., it did not free-drain. No perched water was observed in the upper 2/3 of the pit.
- The lower 1/3 of the pit excavation (8 to 12 feet bgs) consisted of waste oil backfilled with silty clay. The oil matrix was viscous, containing little apparent moisture, but could free-drain into the open pit. When left overnight, the oily material filled the lower 1/3 of the pit.
- A sample of the oily liquid was collected and analyzed for volatiles. Results indicate the liquid was an oil matrix containing 3 to 7 percent benzene, toluene, ethyl benzene, and xylenes (BTEX) and chlorinated solvents.
- Drums were encountered throughout the excavation. They were partially intact (60-80 percent of their 55-gallon capacities), and contained the same type of black oily liquid. All drums were punctured, leaking, and had their bungs removed. Most drums were upright, and many were in contact with one another.
- Crushed drums were also encountered that did not contain recoverable liquids; they only contained black viscous sludge.
- No debris such as scrap metal, construction wastes, municipal wastes, or wood was encountered.
- The top half of the excavation contained tires that were randomly distributed.
- Emission control measures were ineffective at limiting fugitive VOC concentrations inside the containment structure.
- It appeared that free liquids in the pit were largely originating from leaking drums, as opposed to bulk liquids that may have been dumped into the pit. No groundwater was encountered to the base of the excavation.

- The capital cost of excavation of the MWP and partial excavation of the NWP was $4.5 million.

4.2 Consideration of Alternative Technologies for Implementing the FTPA Waste Pit Remedy

4.2.1 Screening of Alternative Technologies

Subsequent to granting permission for excavation at the NWP to stop, EPA convened a working group to evaluate alternative technologies for implementing the remedy at the NWP and the south waste pit (SWP). The working group was called the "FTPA Working Group". Participants included representatives of EPA, CDPHE, the Respondents, Tri-County Health Department (TCHD), the City of Aurora, Arapahoe County, and Citizens for Lowry Landfill Environmental Action Now (CLLEAN). CLLEAN is a citizens' group that received a Technical Assistance Grant (TAG) from EPA to encourage citizen involvement in the Superfund process at the Site.

Discussions and meetings that occurred between October 1999 and January 2000 focused on determining an alternative remedial approach that would provide the highest level of treatment at the SWP and the NWP. The FTPA Working Group evaluated alternatives on the basis of the reduction in toxicity, mobility, or volume (TMV) of contaminants provided by each alternative. The objective was to identify an alternative that would provide reduction in TMV consistent with that provided by excavation at the waste pits without the short-term acute worker health and safety concerns associated with excavation.

EPA, in consultation with CDPHE, determined that the most appropriate alternative technology was an *in-situ* recovery of liquids and vapor. The liquid and vapor recovery efforts would be enhanced by heating the waste pit source material above ambient temperatures. At meetings held during December 1999 and January 2000, the FTPA Working Group reviewed available technologies to effectively raise waste pit temperatures. Electrical resistance heating (ERH) was chosen as the most viable technology. A review of the technologies and a recommendation was presented at a FTPA Working Group meeting on January 6, 2000 and at a TAG meeting on January 20, 2000. The FTPA Working Group and the TAG reached a consensus that *in situ* recovery of liquids and vapors augmented with ERH, although never applied in an application similar to the NWP or SWP, was the alternative with the greatest probability of success. All parties agreed that the application of ERH at the FTPA was an innovative application of the technology and that there was uncertainty about how the technology would perform (EPA, 2001).

4.2.2 Pilot Study at the FTPA South Waste Pit

The Respondents conducted a pilot study at the SWP to determine whether the ERH enhanced *in situ* recovery would be effective. They completed field investigations to support pilot study design in 2001 (Parsons, 2001a). Concurrent with design investigations, the Respondents developed a pilot study work plan (Parsons, 2001b).

EPA established a specific evaluation criterion for the pilot study that was based on a percent reduction in the concentration of xylenes in soil determined by measuring the concentrations before and at the conclusion of the study. The ERH technology application at the SWP would be considered effective if the concentrations of xylenes in soil were reduced by no less than 90 percent. Xylenes were selected to be the indicator chemical for the pilot study based on their presence at high concentrations in the SWP, relatively high boiling point, and potential toxicity. Concentrations of xylenes in the soil at the SWP prior to the start of the pilot study ranged from 2,600 micrograms per kilogram (ug/kg) to 2,300,000 ug/kg with an average concentration of 638,000 ug/kg (Parsons, 2003a).

The Respondents implemented the pilot study beginning in September, 2001. During implementation, the Respondents held onsite meetings and provided written status reports monthly to EPA and the FTPA Working Group. Additionally, four TAG meetings were held to communicate the pilot study progress to the general public. Preliminary/estimated results of the pilot study were presented to the FTPA Working Group on January 17, 2003 (Parsons, 2003b). On January 30, 2003, EPA issued written approval to terminate the pilot study and proceed with post-treatment sampling (EPA, 2003).

The final confirmation soil sampling data indicate that the pilot test did not achieve the target 90 percent reduction of xylenes in soil in the south waste pit. Reductions in the concentration of xylenes in soil ranged from 99 percent at one sampling location to a 2,000 percent increase at another sampling location. Three of fourteen sample locations showed no reduction or increase in concentration. On average, xylene concentrations decreased by 50 percent (Parsons, 2003a). Thus, the pilot study was considered to be only partially successful. Although considered only partially successful at meeting the evaluation criterion, approximately 17,000 kg of VOCs were removed from the SWP during the pilot study (Parsons, 2003a). The cost of the pilot study was $ 8.5 million.

4.3 Reevaluation of the FTPA Waste Pit Remedy

4.3.1 Sum mary of Information Generated Since the 1994 ROD and 1997 ESD

At the conclusion of the SWP Pilot Study in 2003, significant new information had been generated since the 1994 ROD and the 1997 ESD. The new information included the following:

- Actual volumes of waste materials encountered at the NWP and the MWP were significantly greater than volumes estimated at the time of the 1994 ROD.
- Measures to control emissions during excavation such as wetting the soils, misting devices on the perimeter of the excavation, modification of excavation rates, and use of ventilated containment structures were employed to minimize on and off-site exposure to VOCs in air and odor. In addition, a significant amount of air monitoring was required during excavation, including hourly downwind monitoring for VOCs and odor, continuous Site perimeter monitoring, and the use of downwind and upwind particulate samplers and an odor panel. Air monitoring results from samples collected inside the containment structure indicated that

short-term risks to workers resulting from excavation of the waste material using the above-described controls exceeded the short-term risks to workers estimated in the 1994 ROD.

- Pilot scale data were available on effectiveness, implementability, cost, and short-term risks associated with thermally enhanced *in-situ* liquid and vapor recovery technology, an alternative not considered in the 1994 ROD.
- An estimated 38,000 kg of VOCs have been removed from the FTPA waste pits as a result of excavation of the MWP, partial excavation of the NWP, and implementing the pilot study at the SWP.
- The actual costs of implementing the FTPA remedy selected in the 1994 ROD and 1997 ESD at the MWP significantly exceeded the costs estimated in the ROD.
- Multiple years of Site data were available to demonstrate the effectiveness of components of the selected remedy in meeting the remedial action objectives for the Site (Parsons, 2004a).

EPA determined that the information generated since the 1994 ROD and 1997 ESD is significant, is not contained elsewhere in the Administrative Record supporting the 1994 ROD and 1997 ESD, could not have been submitted during the public comment period for the 1994 ROD, and substantially supports the need to significantly alter the response action for the FTPA waste pits. In 2003, EPA required the Respondents to perform a feasibility study (FS) to support EPA's reevaluation of the selected remedy for the FTPA waste pits.

4.3.2 Feasibility Study, FT PA Waste Pit Remedy

From December 2003 until December 2004, the Respondents performed a FS to compare the remedy selected for the FTPA waste pits in the 1994 ROD and the 1997 ESD (modified to address the information generated since the time of the 1994 ROD and 1997 ESD) with other remedial alternatives. This comparison was performed using the nine criteria specified in the NCP for detailed analysis of remedial alternatives. Table 1 is a summary of the alternatives developed and evaluated in the FS. Table 2 is a summary of the comparative analysis of the alternatives.

Based on the evaluation of alternatives using the nine criteria specified in the NCP, EPA selected Capping with Product Recovery to be the remedy for the SWP and the NWP in the FTPA. By this selection, EPA is fundamentally changing the remedy for the FTPA SWP and NWP.

5.0 DESCRIPTION OF ORIGINAL SELECTED REMEDY AND MODIFIED REMEDY

5.1 Remedial Action Objectives

In making this fundamental change to the remedy, EPA has not modified the RAOs for the landfill solids remedy described in the 1994 ROD. When operating effectively, the

components of the sitewide remedy achieve many of the RAOs for landfill solids. Table 3 summarizes how the RAOs are achieved by the sitewide remedy components.

5.2 Original Remedy: Excavation/Onsite Treatment

The components of Excavation/Onsite Treatment include:

- Abandoning/demobilizing existing equipment;
- Shutting-in make-up and process waterlines at each waste pit;
- Excavating and stockpiling clean overburden;
- Excavating source materials (including sludges, soils, debris, drums, etc.) at both waste pits;
- Dewatering of the pits as necessary to complete the work;
- Backfilling and grading excavated areas for positive drainage;
- Offsite disposal of liquids; and
- Treating excavated solids in an onsite treatment cell.

If the original remedy was implemented at the two remaining waste pits, methods similar to those described in the final remedial design (Parsons, 1998) would be used to excavate the SWP and the NWP. However, emission controls would be required to go far beyond that described in the final remedial design. Emission controls would include the construction of an enclosure over each waste pit, over the treatment cell during blending operations, and over the decontamination area. Each enclosure would require ventilation/off-gas treatment systems that could process approximately 36,000 to 60,000 standard cubic feet per minute (scfm) of vapor (approximately four to five air volume exchanges per hour depending on the size of the enclosure). These volumes are based on preliminary estimates of air exchanges required within the containment structures. Off-gas would be treated with a large thermal oxidizer/incinerator. Workers within the enclosures would be required to wear OSHA Level B protection.

A large amount of infrastructure would need to be constructed to implement excavation including:

- Enclosures would be constructed at multiple locations;
- Treatment system pads would be constructed at each incinerator location;
- A natural gas transmission pipeline would be installed near the southeast corner of the Site along Quincy to each incinerator;
- A new decontamination pad would be constructed; and
- The existing drum storage pad would be refurbished to ensure its integrity.

Excavation would continue at each pit until the source material as defined by pilot study design investigation (Parsons, 2001a) is removed. Approximately 19,900 cy (estimated volume of source material plus 10 percent) would be excavated from the SWP. Approximately 13,000 cy (estimated volume of source material plus 10 percent) would be excavated from the NWP. Both unsaturated and saturated materials would be excavated. At completion of the excavation, the open area would be backfilled and the

area graded to promote positive drainage. Excavated material would be segregated for characterization and disposal. Intact drums would be staged on an onsite storage pad for characterization and disposal. Liquids removed from drums or pumped from the open excavation would be bulked into appropriate storage containers and treated offsite by a licensed treatment, storage, and disposal (TSD) contractor. Excavated debris (including wood, smashed drums, etc.) would be decontaminated to the extent practicable and disposed of onsite in an onsite disposal cell. Excavated solids/soils would be bulked on-site with tire chips and placed in the existing onsite treatment cell. Subsequent to construction, vapor extraction would be used to eliminate the hazardous characteristics (i.e., leaching of VOCs) from the solids placed in the treatment cell. After completion, treatment cell solids would be closed in-place.

5.3 Modified Remedy: Capping with Product Recovery

The modified remedy consists of the following components:

- Abandoning/demobilization of any existing equipment;
- Shutting-in the make-up and process waterlines at each waste pit;
- Single phase recovery of Light Non Aqueous Phase Liquid (LNAPL) at the SWP and NWP and Dense Non Aqueous Phase Liquid (DNAPL) at the NWP within and immediately outside the two waste pits;
- Abandoning existing wells and electrodes within and outside the SWP and NWP after performance standards for NAPL recovery have been achieved;
- Offsite treatment and disposal of extracted liquids;
- Regrading the SWP for positive drainage. No regrading necessary at the NWP;
- Completing inspections of earthen cover and performing necessary maintenance (e.g., fix erosion areas, regrade settlement areas, etc.); and
- Groundwater monitoring downgradient of the FTPA area.

The earthen covers over the SWP and the NWP were constructed in 2000 and 2001. The covers extend a minimum of 30 ft beyond the perimeter of the source material. Each cover consists of:

- 6-inch erosion layer;
- 24 inches of compacted clay;
- variable fill depths to meet 2- to 5-percent grade;
- a minimum of 12 inches of gravel wrapped in 6-ounce geotextile; and
- a layer of 20-guage galvanized poultry netting wire mesh below the gravel layer.

Recovery of LNAPL and DNAPL would be accomplished by pumping from existing well points where LNAPL or DNAPL thickness is greater than 0.5 ft. Semi-automatic recovery methods (i.e., either top-loading or bottom-loading manually operated pneumatic pumps) would be used to extract liquids. Recovered liquids would be stored onsite. It is estimated that up to 10,000 gallons, 5,000 gallons at each waste pit, would be stored onsite. Samples of the liquids would be collected and analyzed to determine the

concentrations of VOCs in the liquids. The results would be used to quantify the amount of contaminant mass removed. Recovered liquids would then be transported to a licensed treatment and disposal facility via tanker truck.

Liquid recovery would continue at each well point until LNAPL thickness fell below 0.5 ft and DNAPL thickness fell below 0.5 ft for greater than 30 days when measured at static conditions. At that time, recovery at that well point would be discontinued. When all well points meet the performance standard, well points would be abandoned and equipment demobilized.

6.0 EVALUATION OF THE ORIGINAL SELECTED REMEDY AND MODIFIED REMEDY USING THE NINE NCP CRITERIA

6.1 Original Selected Remedy: Excavation/Onsite Treatment

6.1.1 Overall P rotection of Human Health and the Environment

Excavation/Onsite Treatment achieves the RAOs for Landfill Solids with a combination of existing remedial components and removing the source material at the FTPA waste pits through excavation. Four of the seven RAOs for Landfill Solids are achieved with existing remedial components (Table 3). The remaining RAOs for Landfill Solids are achieved as follows:

- Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill solids, to the saturated zone and groundwater, would be achieved by removing the source material through excavation.
- Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water, would be achieved by removing the source material through excavation.
- Prevention of offsite migration of landfill solids and soils intermingled with solids into other media would be achieved by removing the source material through excavation.

The short-term risks to the public and workers associated with excavation of the source material are high, leading to a low level of short-term protectiveness. This is mainly due to the potential exposures of onsite workers and the public to air emissions of VOCs during excavation activities.

Excavation/Onsite Treatment employs treatment to address principal threat wastes at the SWP and the NWP. However, from a sitewide perspective, Excavation/Onsite Treatment would not change the residual risk at the Site. This is because the volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the total volume of waste pit liquids remaining at the Site. The volume of waste pit solids associated with the two FTPA waste pits is less than 2.4 percent of the total volume of waste pit solids remaining at the Site. All existing components of the sitewide remedy will remain in place after completion to ensure the long-term effectiveness of the sitewide remedy.

6.1.2 Co mpliance with Applicable or Relevant and Appropriate Requirements (ARARs)

A summary of requirements that are potentially ARARs is set forth in Table 4. Requirements related to construction activities such as requirements for control of hazardous air pollutants, fugitive dust and odor in ambient air and noise abatement would be applicable during construction. These ARARs would be met by employing extensive emissions control and dust suppression measures and by limiting the period during which construction may occur. Requirements related to the characterization, storage, transport, treatment and disposal of solid and liquid wastes would be ARARs. These requirements would be met by employing proper procedures for characterization and transport and by designing storage, treatment and disposal to comply with the requirements.

6.1.3 Long -Term Effectiveness and Permanence

All existing remedy components will remain in-place ensuring the long-term effectiveness and permanence of the sitewide remedy. Existing monitoring programs would be effective at ensuring the adequacy and reliability of the containment components of the sitewide remedy. From a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. Excavation/Onsite Treatment employs treatment to address principal threat wastes from the SWP and the NWP. The contaminants within the source material would be removed through excavation. However, residual contamination (including NAPL) would remain outside the source area, continuing to contribute to groundwater contamination.

6.1.4 Reduction of Toxicity, Mobility, and Volume (TMV) Through Treatment

Excavation/Onsite Treatment would result in TMV reduction through the excavation and treatment of the source material. Approximately 20,000 cy will be excavated from the SWP and 13,000 cy will be excavated from the NWP. Based on the estimates of contaminant mass remaining at both the SWP and NWP, approximately 200,000 kg of VOCs will be excavated and either transported off-site for disposal or placed in an onsite treatment cell for further treatment. This reduction in TMV is in addition to the removal of approximately 38,000 kg of VOCs from the FTPA as a result of excavation of the MWP, partial excavation of the NWP, and implementation of the pilot study at the SWP.

Based on estimates of the volume to be excavated from the NWP and the SWP, sitewide over 97-percent of the waste pits solids at the Site will remain in other waste pits after completion (Parsons, 2004b).

6.1.5 Short -Term Effectiveness

There is a potential that ambient air quality would degrade during excavation, thus posing a risk to members of the community. The nearest receptor is approximately 1 mile away. Onsite receptors may be closer than 1 mile away. Given the experience in 1998 and 1999, the use of structures over the waste pits during excavation and the installation and operation of large off-gas treatment systems using incineration will be required to mitigate these risks. Risks would also be posed to members of the community from truck traffic associated with transportation of excavated solids/liquids offsite for disposal.

Risks would be posed to onsite workers due to the operation of heavy equipment and the possibility of exposure during excavation activities. Section 4.1 of this ROD Amendment describes the short-term risks to workers during attempts to excavate the NWP in 1999. Of particular concern to health and safety is the fact that the chlorinated VOCs and naphthalene have relatively low Immediate Danger to Life and Health (IDLH) values (e.g., 50 ppm for 1,2-dichloroethane, 150 ppm for tetrachloroethene, and 250 ppm for naphthalene), meaning that they can cause adverse human health effect at much lower air concentrations than were measured during the 1999 excavations. Also, the BTEX compounds detected in the liquids at the NWP have relatively low Lower Explosive Limits (LELs) (e.g., 10-percent LEL for BTEX compounds range from 800 ppm to 1,100 ppm). Thus, there were unsafe working conditions due to the potential for toxicity to an unprotected worker and/or explosion at the airborne VOC concentrations detected by health and safety monitoring during the 1999 excavations.

This experience demonstrates that engineering controls with much greater capacity and efficiency than the enclosures and off-gas treatment systems used at the NWP in 1999 would be required to minimize the risk of exposure discussed above. Other techniques such as extensive construction dewatering and soil vapor extraction prior to excavation could reduce the potential risk. However, construction dewatering and soil vapor extraction are not expected to significantly impact the alternative's short-term effectiveness because of the increased time associated with remedy completion along with the remaining potential for exposure to contaminants.

The short-term risk to the community and workers during the excavation would be high. The time to complete construction of the remedy is expected to be 4 to 5 years.

6.1.6 Imple mentability

Overall, the implementability of Excavation/Onsite Treatment is expected to be low. Enclosures would be required to be constructed at all material handling locations. Large off-gas treatment systems (36,000 to 60,000 scfm) would be required to treat the off-gas from these enclosures. These treatment systems would be constructed specifically for this project and most likely use incineration. Electrical upgrades would be required and fuel lines (natural gas) would need to be installed to each treatment system.
Onsite workers within the containment structures would be operating in an OSHA Level B environment requiring personnel protective equipment and supplied air. A strict health and safety protocol would be required.

Administratively, implementation would involve a high level of effort. Designs would need to be submitted to EPA and CDPHE for review and EPA approval. In particular, the design and implementation of the exposure mitigation strategy (enclosures, off-gas treatment systems, and health and safety protocols) would require a high level of detail and review. In addition, for offsite disposal of hazardous wastes, an offsite rule determination for the disposal facility would be required.

6.1.7 Cost

The estimated net present worth cost for Excavation/Onsite Treatment is $13,200,000. The estimated capital cost is $11,600,000. The estimated yearly operations and maintenance cost is $785,000.

6.1.8 State Ac ceptance

CDPHE believes that Excavation/Onsite Treatment is the most protective alternative, because it removes a large quantity of principal threat wastes from an area in close proximity to preferential groundwater pathways.

6.1.9 Co mmunity Acceptance

No comments in support of Excavation/Onsite Treatment were received from the public during the 30-day public comment period for the Proposed Plan for the Former Tire Pile Area. Although CLLEAN (the citizens' group that received a TAG grant from EPA) stated that they would prefer Excavation/Onsite Treatment, they recognize it is very costly, difficult to undertake and fraught with potentially dangerous side effects. CLLEAN stated that with the risks involved, the amount of material that could possibly be treated, and the cost/benefit for treatment, it does not seem reasonable to undertake Excavation/Onsite Treatment and so supported the modified remedy, Capping with Product Recovery. The public comment period was from May 26, 2005 until June 27, 2005.

6.2 Modified Remedy: Capping with Product Recovery

6.2.1 Overall P rotection of Human Health and the Environment

Capping with Product Recovery achieves the RAOs for Landfill Solids with a combination of existing remedial components and the placement of an engineered cap over the source areas. Four of the seven RAOs for Landfill Solids are achieved with existing remedial components (Table 3). The remaining RAOs for Landfill Solids are achieved as follows:

- Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill soils, to the saturated zone and groundwater, would be achieved by the engineered cap on the SWP and the NWP. The cap would reduce the infiltration of precipitation to the source material. Modeling indicates that infiltration through the unsaturated zone is reduced by 60 to 70 percent with the addition of an engineered cap from roughly 10,200 gallons per year without a cap to 3,500 gallons per year with a cap (total for both caps) (Parsons, 2004).
- Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water, would be achieved by the engineered cap which provides a physical barrier between the surface and the source material. A minimum of 3.5 ft of clean cap material would be maintained over the waste pits eliminating the possibility of erosion or entrainment of contaminated soil particles.
- Prevention of offsite migration of landfill solids and soils intermingled with solids into other media would be achieved by the engineered cap which provides a physical barrier between the surface and the source material.

The short-term risks to the public and workers are relatively low leading to a moderate to high level of short-term protectiveness.

Capping with Product Recovery employs treatment to address principal threat wastes (NAPL) at the SWP and the NWP. However, from a sitewide perspective, implementation of Capping with Product Recovery would not change the residual risk at the Site. This is because the volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the total volume of waste pit liquids remaining at the Site. All existing components of the sitewide remedy will remain in place after completion of Capping with Product Recovery to ensure the long-term effectiveness of the sitewide remedy.

6.2.2 Compliance with ARARs

A summary of requirements that are potentially ARARs is set forth in Table 4. Requirements related to construction activities such as requirements for control of fugitive dust in ambient air and noise abatement would be applicable during construction. These ARARs would be met by employing dust suppression measures and by establishing controls on the period during which construction may occur. Requirements related to the characterization, storage, transport, treatment and disposal of solid and liquid wastes would be ARARs. These requirements would be met by employing proper procedures for characterization and transport and by designing storage to comply with the requirements. Requirements for treatment and disposal would be met by ensuring the offsite disposal facility is in compliance with the requirements.

6.2.3 Long-Term Effectiveness and Permanence

All existing sitewide remedy components will remain in place ensuring the long-term effectiveness and permanence of the sitewide remedy. Capping with Product Recovery employs offsite treatment to address principal threat wastes at the SWP and the NWP, permanently removing this source material from the Site. However, from a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. This is because the volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the total volume of waste pit liquids remaining at the Site beneath the main landfill mass.

6.2.4 Reduction of Toxicity, Mobility, and Volume Through Treatment

Capping with Product Recovery would result in TMV reduction through the removal and offsite treatment and disposal of NAPL (both LNAPL and DNAPL) from the FTPA waste pits.

Capping with Product Recovery is expected to extract approximately 36,000 to 37,000 gallons of NAPL and approximately 36,000 to 37,000 gallons of groundwater, resulting in approximately 24,000 to 25,000 kg of VOCs being removed from the SWP and the NWP. This reduction in TMV is in addition to the removal of approximately 38,000 kg of VOCs from the FTPA as a result of excavation of the MWP, partial excavation of the NWP, and implementation of the pilot study at the SWP. Over 99 percent of the reduction in volume of waste will come from the NWP because of VOC removal

activities already completed at the SWP. Over 80 percent (approximately 170,000 kg) of the contaminants in the FTPA will remain in place after completion of Capping with Product Recovery.

6.2.5 Short-Term Effectiveness

The short-term risk to the community and workers during the implementation of this alternative would be low to moderate leading to a moderate to high level of short-term effectiveness. Work would remain largely onsite. Transportation of fill material from offsite locations is not expected. Risks would be posed to members of the community due to truck traffic associated with transportation of extracted liquids offsite for disposal, but these are expected to be low. Risks would be posed to onsite workers due to the operation of heavy equipment and the potential for contaminant exposures during product recovery activities. The time to complete construction of the remedy is expected to be 6 to 7 years.

6.2.6 Implementability

Overall, the implementability of Capping with Product Recovery is expected to be moderate to high. The capping portion of the remedy is largely in place. Conventional measures would be used to complete the capping remedy. Goods and services for these parts would be readily available.

Administratively, implementation would be limited to the submittal of a work plan detailing the work to be completed, submittal of progress reports, and a closeout report at completion. In addition, for offsite disposal of hazardous wastes, an offsite rule determination for the disposal facility would be required. The administrative implementability of Capping with Product Recovery is expected to be high.

6.2.7 Cost

The estimated net present worth cost for Capping with Product Recovery is $887,000. The estimated capital cost is $393,000. The estimated yearly operations and maintenance cost is $112,800.

6.2.8 State Acceptance

CDPHE feels that Capping with Product Recovery does not address source control and the continued migration of contamination from the FTPA. The remedy relies on boundary containment and the monitoring network at the point of compliance to determine if such migration is a problem. CDPHE therefore considers it important to continue groundwater investigations regarding lineaments and offsite contamination in Section 31 to insure that fate and transport of contaminants in this area is understood, and that the monitoring network has appropriate well locations regarding transport of contaminants from the FTPA.

6.2.9 Community Acceptance

The comments received from the public during the 30-day public comment period for the Proposed Plan for the Former Tire Pile Area were unanimously in support of Capping

with Product Recovery as the remedy for the FTPA SWP and NWP. The public comment period extended from May 26, 2005 until June 27, 2005.

6.3 Summary

Table 5 provides a side-by-side comparison of the nine criteria analysis of the original selected remedy and the modified remedy.

6.4 Rationale for EPA's Selection of Modified Remedy

EPA selected Capping with Product Recovery over Excavation/Onsite Treatment because it achieves a level of overall protection of human health and the environment similar to Excavation/Onsite Treatment when implemented along with the other components of the sitewide remedy, and it achieves the RAOs for landfill solids. Although excavation would result in removal of all source material at the FTPA, the volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the total volume of waste pit liquids remaining at the Site. The volume of waste pit solids associated with the two FTPA waste pits is less than 2.4 percent of the total volume of waste pit solids remaining at the Site. Although Excavation/Onsite Treatment would result in treatment of a greater volume of principal threat waste (NAPL) than Capping with Product Recovery, the volume of principal threat waste that would be removed by excavation at the FTPA waste pits would not reduce overall Site risk.

Compared to Excavation/Onsite Treatment, Capping with Product Recovery is more easily implemented, less costly and presents far less risk to workers and the surrounding community. Implementation of Excavation/Onsite Treatment would not change the effectiveness of the overall sitewide remedy in achieving the RAOs since other remedy components achieve these RAOs, yet it presents higher risks to workers and the community.

EPA considered the risks and the benefits of the two alternative remedies, and determined that Capping with Product Recovery best meets the nine evaluation criteria in the NCP.

A summary of the original selected remedy, the new information generated since the 1994 ROD and the 1997 ESD, and EPA's selected modification to the remedy is provided in Table 6.

7.0 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency must select remedies that are protective of human health and the environment, comply with applicable or relevant and appropriate requirements (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias

against offsite disposal of untreated wastes. The following section discusses how the selected remedy meets these statutory requirements.

7.1 Protection of Human Health and the Environment

The selected remedy for the FTPA waste pits will protect human health and the environment by providing a physical barrier (the cap) which will:

- reduce infiltration of precipitation to the source material in each waste pit, thus minimizing the production and migration of leachate; and
- provide a physical barrier between the surface and the source material, thus minimizing the migration of soils intermingled with contaminated material caused by erosion.

The selected remedy for the FTPA waste pits, along with the other components of the selected sitewide remedy, will protect human health and the environment by achieving the RAOs established by EPA for the Site. The short-term risks to workers and community associated with implementing the selected remedy for the FTPA waste pits is low to moderate and can be controlled.

7.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy for the FTPA waste pits will comply with all ARARs. The ARARs are presented in Table 7.

7.3 Cost Effectiveness

EPA determined that the selected remedy for the FTPA waste pits is cost-effective. In making this determination, EPA used the following definition: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP Section 300.430(f)(1)(ii)(D)). EPA evaluated the overall effectiveness of the original remedy selected for the FTPA waste pits against the overall effectiveness of the modified remedy and then compared the costs of the two remedies.

The estimated net present worth cost of the selected remedy, Capping with Product Recovery, is $887,000. The estimated net present worth cost of the original remedy, Excavation/Onsite Treatment, is $12,313,000 more than the selected remedy yet provides a similar level of long-term effectiveness and permanence and a much higher short-term risk to the community and workers. In addition to the cost of the selected remedy, over $13 million has been spent on remedial action at the FTPA.

7.4 Utilization of Permanent Solutions and Alternative Treatment Technologies (or Resource Recovery Technologies) to the Maximum Extent Practicable

EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the FTPA waste pits. Both the original remedy and the selected remedy for the FTPA waste pits are protective of human health and the environment and comply with ARARs. EPA determined that the selected remedy provides the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and State and community acceptance.

7.5 Preference for Treatment as a Principal Element

Treatment of the NAPL extracted from the NWP and SWP at an offsite treatment and disposal facility addresses principal threats posed by the NWP and the SWP through the use of treatment technologies. In addition, approximately 38,000 kg of VOCs have been removed from the FTPA and treated as a result of excavation of the MWP, partial excavation of the NWP, and implementation of the pilot study at the SWP.

7.6 Five Year Review Requirements

The FTPA waste pit remedy is a component of the sitewide remedy for the Site. Because the sitewide remedy results in hazardous substances remaining on the Site above levels that allow for unlimited and unrestricted use and unrestricted exposure, a statutory review will be conducted at least every five years after initiation of remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Remedial action was initiated at the Site in 1996. The first Five Year Review was conducted in 2001.

8.0 THE SELECTED REMEDY FOR THE FTPA WASTE PITS

The selected remedy for the FTPA north waste pit (NWP) and south waste pit (SWP) is changed from excavation to:

- Extraction of NAPL from within and immediately outside the NWP and SWP using either top-loading or bottom-loading pumps installed in existing wells;
- Onsite temporary storage of extracted liquids;
- Transportation and offsite treatment and disposal of extracted liquids;
- Maintenance of the existing cap on each waste pit; and
- Groundwater monitoring downgradient of the FTPA waste pits.

The selected remedy shall achieve the landfill solids RAOs described in Section 11.3 of the 1994 ROD for the Lowry Landfill Superfund Site.

The performance standards for the selected remedy are:

- Extraction of NAPL shall continue at each well point until the LNAPL thickness is less than or equal to 0.5 feet and the DNAPL thickness is less than or equal to 0.5 feet for a period of at least 30 days;
- Recovered liquids shall be characterized for off site treatment and disposal; Hazardous waste shall be identified in accordance with criteria contained in 6 CCR 1007-3 Part 261;
- Recovered liquids shall be stored onsite temporarily. Storage shall meet the requirements of 6 CR 1007-3 Part 265, Subparts I and/or J;
- Recovered liquids shall be transported offsite for treatment and disposal. Shipment of hazardous waste offsite shall comply with 6 CCR 1007-3 Parts 262 and 263;
- Recovered liquids shall be shipped to an offsite treatment and disposal facility that complies with 40 CFR 300 Part 440; and
- The remedy shall comply with ARARs identified in Table 7.

9.0 SUMMARY OF SUPPORT AGENCY COMMENTS ON THE ROD AMENDMENT

CDPHE's main concern is that the selected remedy for the FTPA north waste pit (NWP) and south waste pit (SWP) will not remove the majority of the waste, nor will it contain the waste. CDPHE's concern is further compounded by data they believe show that vertical hydraulic gradients at the Site are strongly downward, and preferential pathways exist directly under these pits that will allow contamination to be transported downward, laterally, and offsite. CDPHE does not oppose EPA's selection of Capping with Product Recovery on the condition that if it is determined that contaminants from the FTPA are migrating along preferential pathways at levels exceeding performance standards at the point of compliance, appropriate response actions will be taken consistent with the EPA-approved final Groundwater Monitoring Plan.

10. RESPONSIVENESS SUMMARY

This section presents EPA's responses to comments received on the May, 2005 Proposed Plan for the Former Tire Pile Area during the public comment period.

10.1 EPA Response to Comments from the Citizens for Lowry Landfill Environmental Action Now (CLLEAN), June 24, 2005 and June 27, 2005 Emails

Comment

"Following are CLLEAN's comments regarding the Former Tire Pile Area (FTPA) Proposed Plan:

As CLLEAN understands it, there are a number of alternatives being evaluated by the EPA for the FTPA; however, they break down into roughly three categories: 1.Do nothing but cap. 2.Cap and add some kind of passive removal through wells. 3.Some form of major treatment such as excavation and removal or a more intensive in-place treatment.

CLLEAN would prefer Alternative 9: Excavation/Onsite Treatment. However, CLLEAN recognizes that alternatives 3 - 9 are all very costly, difficult to undertake and fraught with potentially dangerous side effects. With the risks involved, the amount of material that could possibly be treated, and the cost/benefit for treatment, it does not seem reasonable to undertake any of these alternatives.

Item 2 has alternatives that fall within CLLEAN's objectives for the Stie. It is protective of the surrounding areas as best as can be achieved and removes contaimination. Many people argue that the amount of free product recovery is small compared to the amount in the area. A point that is missed is that the free product is what threatens the environment. A certain amount of material is bound into the trash and soil. We do not know

what that amount is; however, it is not moving into the air or water as it is to some degree immobilized. It is the free product that is going to move. To limit the free product only makes sense. This can be done for minimal additional cost over just capping.

A complicating factor to take into consideration is that the areas around the designated Tire Pile Areas does not fully address the issues here. The Respondents do not want to get into an issue of where the contamination outside the pit areas came from or where to stop treating. It is easy to see why they prefer the "hands off" approach, i.e., just cap.

CLLEAN believes that the FTPA is not the primary threat at the Lowry Landfill Superfund Site. CLLEAN's opinion is that the primary threat to public health and the environment are the deeper chemicals and the possible movement towards the aquifers. Also, CLLEAN has witnessed an increasing number of "surprise discoveries" at other areas of the Superfund Site and CLLEAN believes that there will be more in the future and that those areas will be far more serious and difficult to address.

Therefore, CLLEAN does support Alternative 4 as the choice of technology for the FTPA."

EPA Response

EPA appreciates CLLEAN's many years of dedicated involvement at the Lowry Landfill Site and acknowledges CLLEAN's support of Alternative 4, Capping with Product Recovery, as expressed in the Proposed Plan.

10.2 EPA Response to Comments from the Tri County Health Department, June 23, 2005 Letter

Comment

"Tri-County Health Department (TCHD) has reviewed the EPA announcement on the Proposed Plan for the Former Tire Pile Area dated May 2005. At this time, TCHD has no specific comments or concerns and fully supports the EPA's recommendation of Preferred Alternative number 4. TCHD agrees with the EPA that Preferred Alternative Number 4 in conjunction with the implementation of the remedy components and compliance monitoring will be protective of public health and the environment. Thank you for considering TCHD's comments on this issue."

EPA Response

EPA appreciates and acknowledges TCHD's support of Alternative 4, Capping with Product Recovery, as expressed in the Proposed Plan.

10.3 EPA Response to Comments from Jo Ann Carrier, June 26, 2005 Email

Comment

"I attended the Tues June 14th information meeting you held, and gladly learned a lot of this situation. Being relatively new to the area it was a "shock" to me to learn my family lived so near to a toxic pit and it was not a legal requirement that I be notified specifically of this before my family was allowed to purchase a home less than a mile "as the crow fliies" from the hazard.

Listening to the various methods of resolving this issue I do agree that method #4 does sound like the best of the necessary evil solutions .....

Thank you for your patience in explaining so much to me. It still bothers me that this could have happened, but at least I hopefully know the pros/cons of what is being done to preclude further damage.

Will homeowners in the area be individually notified of when a new clean up will start and what the method of inplamentation will be?"

EPA Response

EPA appreciates and acknowledges Ms. Carrier's support of Alternative 4, Capping with Product Recovery. EPA will publish a notice of the availability of the ROD Amendment in the local newspaper and intends to notify individual homeowners in the vicinity of the Site of details of the implementation of the selected remedy, including when implementation will begin.

11. REFERENCES

EPA, 2001. Memorandum to FTPA Work Group Participants. Subject: Lowry Landfill Superfund Site – Performance Standards and Goals for the North and South Former Tire Pile Area Waste Pit Six Phase Pilot Project for the Administrative Order for Remedial Design/Remedial Action EPA Docket No. CERCLA VIII. December 13.

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Parsons, 1999a. Draft Interim Construction Closeout Report, Former Tire Pile Area Waste Pit Remedy. October 15.

Parsons, 1999b. Letter to Marc Herman, EPA Remedial Project Manager. Subject: Notification of Temporary Work Cessation of Northern Waste Pit, and Request to Resample Southern Waste Pit, FTPA Waste Pit Remedy, Lowry Landfill Superfund Site. May 12.

Parsons, 2001a. Draft FTPA Waste Pit Remedy Design Investigation Report. September 14.

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Parsons, 2003a. Draft FTPA Waste Pit Remedy South Waste Pit Pilot Study Closeout Report. June 6.

Parsons, 2003b. FTPA Working Group Status Meeting Briefing Package. January 17.

Parsons, 2004a. Operations and Maintenance Status Report, Fourth Quarter 2003. January 30.

Parsons, 2004b. Final Feasibility Study FTPA Waste Pit Remedy. December 30.

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Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region 8

8/12/05
Date

Gary Baughman, Director
Hazardous Materials and Waste Management Division
Colorado Department of Public Health and Environment

8/12/05
Date

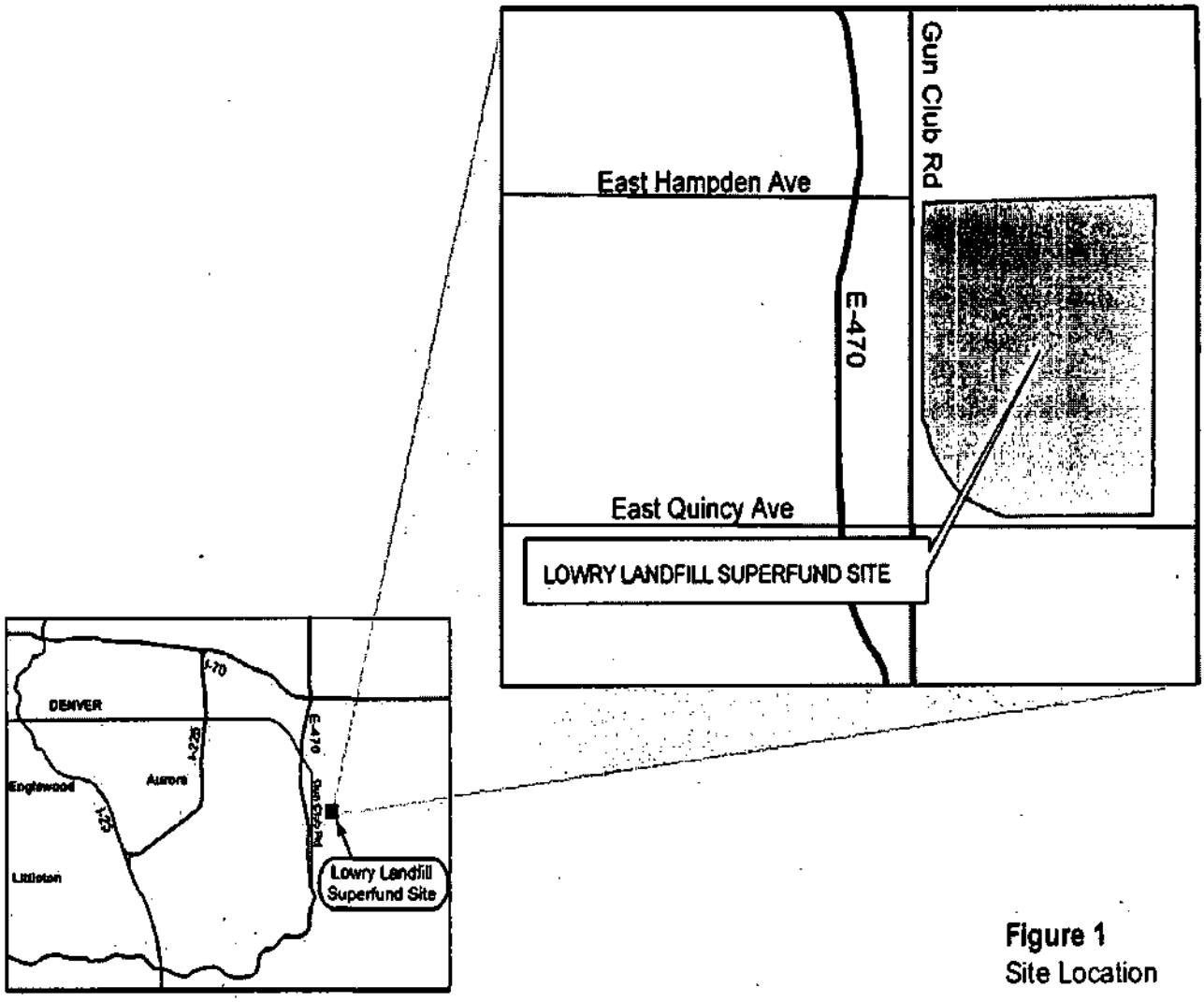

Figure 1
Site Location

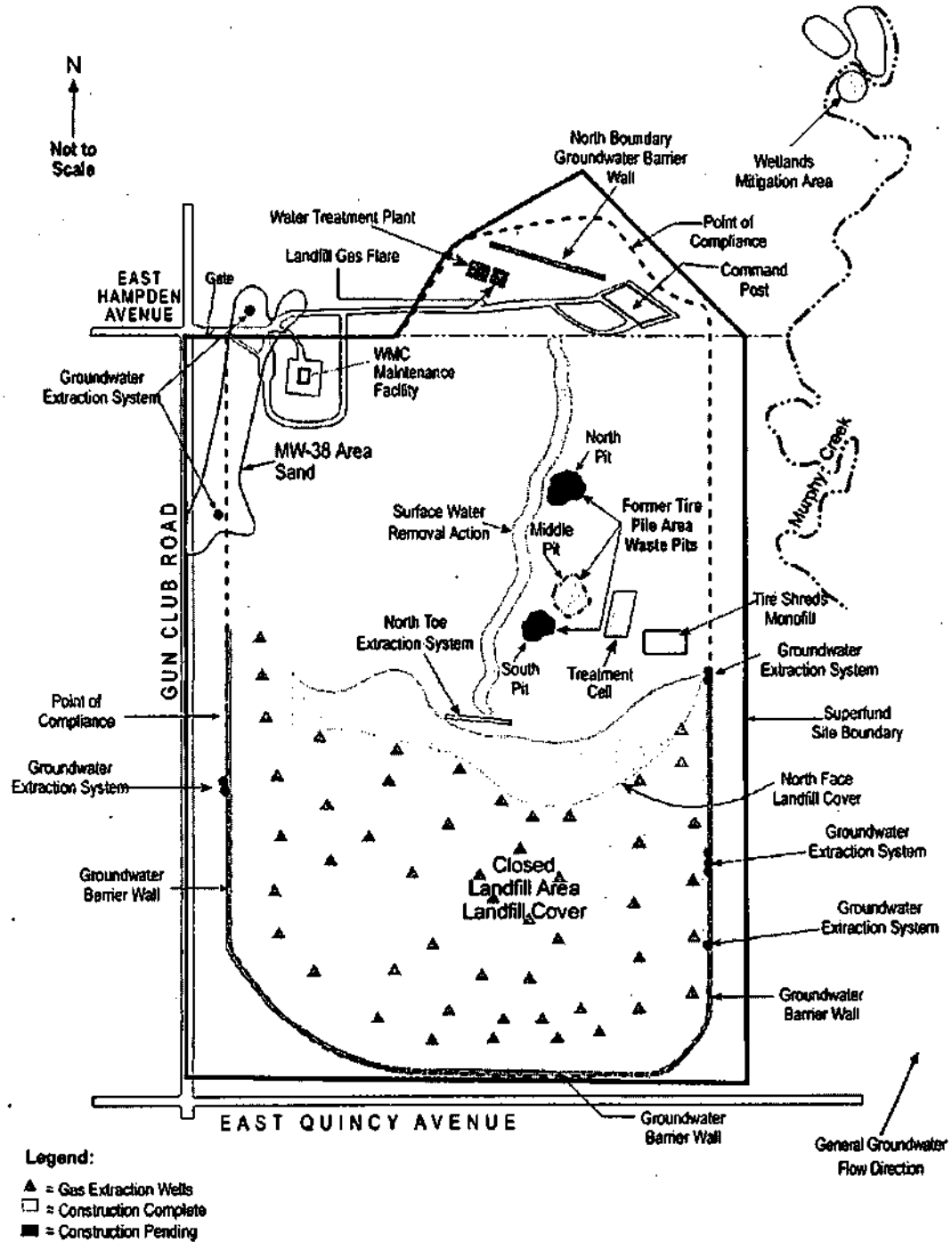

Figure 2
Site Remedy Details

TABLE 1: SUMMARY OF ALTERNATIVES EVALUATED IN FEASIBILITY STUDY FOR THE FTPA WASTE PIT REMEDY

ALTERNATIVE	NAME	MAJOR COMPONENTS
1	Capping	• Abandoning/demobilization of any existing equipment; • Shutting-in the make-up and process waterlines at each waste pit; • Abandoning existing wells and electrodes within and outside the SWP (total of 137 points) and NWP (total of 32 points); • Regrading the SWP for positive drainage. No regrading necessary at the NWP; • Completing inspections of earthen cover and performing necessary maintenance (e.g., fix erosion areas, regrade settlement areas, etc.); and • Groundwater monitoring downgradient of the FTPA area.
2	Capping, Vertical Barrier, Limited Groundwater Extraction and Treatment	• All components of Alternative 1; and • Installing vertical barrier (assume slurry wall) around the perimeter of each waste pit keyed into the weathered/unweathered Dawson contact.
3	Capping, Vertical Barrier, Subsurface Horizontal Barrier, Limited Groundwater Extraction and Treatment	• All components of Alternative 2; • Installing subsurface horizontal barrier beneath each waste pit.
4	Capping with Product Recovery	• All components of Alternative 1; and • Single phase recovery of Light Non Aqueous Phase Liquid (LNAPL) at the SWP and NWP, and Dense Non Aqueous Phase Liquid (DNAPL) at the NWP, within and immediately outside the two waste pits. • Abandoning existing wells and electrodes within and outside the SWP and NWP after performance standards for NAPL recovery have been achieved; • Offsite treatment and disposal of extracted liquids.
5	Capping with Enhanced Product Recovery	• All components of Alternative 1; • Dual phase extraction to enhance recovery of LNAPL within and immediately outside the two waste pits; • Single phase recovery of DNAPL at the NWP within and immediately outside the NWP; • Abandoning existing wells and electrodes within and outside the SWP and NWP after performance standards for NAPL recovery have been achieved; and • Offsite treatment and disposal of extracted liquids.

TABLE 1 (Cont): SUMMARY OF ALTERNATIVES EVALUATED IN FEASIBILITY STUDY FOR THE FTPA WASTE PIT REMEDY

ALTERNATIVE	NAME	MAJOR COMPONENTS
6	Capping with Product Recovery and Vapor Recovery	• All components of Alternative 1 and Alternative 4; • Vapor recovery from the SWP and the NWP; • Treatment of vapor via onsite landfill gas flare or flameless thermal oxidizer; and • Abandoning existing wells and electrodes within and outside the SWP and NWP after performance standards for NAPL recovery and vapor recovery have been achieved.
7	Capping with Enhanced Product Recovery And Vapor Recovery	• All components of Alternative 1, Alternative 5, and Alternative 6.
8	Capping with Thermally Enhanced Product Recovery and Vapor Recovery	• All components of Alternative 1, Alternative 4, and Alternative 6; • Thermally enhance liquid and vapor recovery by increasing subsurface temperatures using Electrical Resistance Heating; and • Implement lessons learned from the Pilot Study at the SWP.
9	Excavation with Onsite Treatment	• Abandoning/demobilizing existing equipment; • Shutting-in make-up and process waterlines at each waste pit; • Excavating and stockpiling clean overburden; • Excavating source materials (including sludges, soils, debris, drums, etc.) at both waste pits; • Constructing decontamination pad; • Refurbishing drum storage pad; • Constructing enclosures with ventilation and off-gas treatment systems over all material handling locations; • Dewatering of the pits as necessary to complete the work; • Backfilling and grading excavated areas for positive drainage; • Offsite disposal of liquids; and • Onsite treatment of solids in treatment cell.

TABLE 2: SUMMARY OF COMPARATIVE ANALYSIS

Criteria	Alt 1: Capping	Alt 2: Capping/Vertical Barrier with Limited Groundwater Extraction and Treatment	Alt 3: Capping/Vertical Barrier/Subsurface Horizontal Barrier with Limited Groundwater Extraction and Treatment	Alt 4: Capping/Product Recovery	Alt 5: Capping/Enhanced Product Recovery	Alt 6: Capping/Product Recovery/Vapor/ Recovery	Alt 7: Capping/Enhanced Product Recovery/ Vapor Recovery	Alt 8: Capping/Product Recovery/Vapor Recovery/Thermal Enhancement	Alt 9: Excavation/Onsite Treatment
Overall Protection of Human Health and the Environment	Achieves RAOs except does not minimize the horizontal movement of NAPLs. High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. Reduces horizontal migration of NAPLs. Moderate to High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. Reduces horizontal migration of NAPLs. Moderate to High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. Reduces horizontal migration of NAPLs. Moderate to High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. Reduces horizontal migration of NAPLs. Moderate to High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs. Reduces horizontal migration of NAPLs. Moderate to High Short-Term Effectiveness. Does not change the Sitewide risk.	Achieves RAOs slightly better than Alternatives 4-8 because of minimizing horizontal migration of NAPLs. Low Short-Term Effectiveness. Does not change the Sitewide risk.
Compliance with ARARs	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.
Long-Term Effectiveness and Permanence.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.	Does not change the Sitewide risk. Existing actions provide long term protection.
Reduction of Toxicity, Mobility and Volume through treatment	No reduction in TMV provided by Alternative 1.	No reduction in TMV provided by Alternative 2.	No reduction in TMV provided by Alternative 3.	Moderate reduction of TMV. Treatment of ~24,000 kilograms (kg) VOCs and 37,000 gallons principal threat waste.	Moderate reduction of TMV. Treatment of ~41,000 kg VOCs and 37,000 gallons principal threat waste.	Moderate reduction of TMV. Treatment of ~83,000 kg total VOCs and 37,000 gallons principal threat waste.	Moderate reduction of TMV. Treatment of ~100,000 kg total VOCs and 37,000 gallons principal threat waste.	Moderate to high reduction of TMV. Treatment of ~105,000 kg Total VOCs and 64,000 gallons of principal threat waste.	Highest reduction of TMV of all Alternatives. ~203,000 kg Total VOCs treated.
Short-Term Effectiveness	High level of short-term effectiveness. Low risk to workers and community. 6 to 12 months to complete.	High level of short-term effectiveness. Low risk to the community. Slightly higher risks to workers than Alternative 1. 6 to 18 months to complete.	High level of short-term effectiveness. Low risk to the community. Slightly higher risks to workers than Alternative 1. 1.5 to 2.5 years to complete.	Moderate to high level of short-term effectiveness. Slightly higher risk to the community than Alternatives 1-3 due to transport of liquids offsite. Slightly higher risks to workers than Alternative 1. 6 to 7 years to complete.	Moderate to high level of short-term effectiveness. Slightly higher risk to the community than Alternatives 1-3 due to transport of liquids off site. Slightly higher risks to workers than Alternative 1. 4 to 5 years to complete.	Moderate to high level of short-term effectiveness. Slightly higher risk to the community than Alternatives 1-3 due to transport of liquids offsite. Slightly higher risks to workers than Alternative 1. 6.5 to 7.5 years to complete.	Moderate to high level of short-term effectiveness. Slightly higher risk to the community than Alternatives 1-3 due to transport of liquids offsite. Slightly higher risks to workers than Alternative 1. 5 to 6 years to complete.	Moderate level of short-term effectiveness. Presents higher risk to workers and community than Alternatives 1-7. 2 to 3 years to complete.	Low level of short-term effectiveness. Presents highest risk to workers and community of all Alternatives. 4 to 5 years to complete.
Implementability	High level of implementability.	Moderate to high-level of implementability.	Low level of implementability.	Moderate to high level of implementability.	Moderate to high level of implementability.	Moderate to high level of implementability.	Moderate to high level of implementability.	Moderate level of implementability.	Low level of implementability.
Cost ((30 year net present worth)	$244,000	$1,770,000	$17,500,000	$887,000	$6,080,000	$4,040,000	$8,060,000	$9,960,000	$13,200,000
State Acceptance				With certain conditions, State does not oppose selection of this Alternative.					State believes Alternative 9 is most protective
Community Acceptance	No comments	No comments	No comments	Public comments support this alternative	No comments	No comments	No comments	No comments	No comments

TABLE 3: REMEDIAL ACTION OBJECTIVES ANALYSIS

REMEDIAL ACTION OBJECTIVE	REMEDY COMPONENT	ACHIEVEMENT OF REMEDIAL ACTION OBJECTIVE
Protection of human health and the environment from direct contact or ingestion of landfill solids or soils intermingled with landfill solids containing contaminants.	Institutional Controls	Restricts access; Restricts land use to landfilling, monitoring or remediation activities or other uses not inconsistent with the selected remedy, performed under appropriate health and safety plans.
Protection of humans from inhalation of volatilized contaminants from landfill solids or soils intermingled with landfill solids, and inhalation of contaminated airborne matter from soils or landfill solids that exceed performance standards.	Institutional Controls	Restricts access; Restricts land use to landfilling, monitoring or remediation activities or other uses not inconsistent with the selected remedy, performed under appropriate health and safety plans.
Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill solids, to the saturated zone and groundwater.	Existing sitewide remedy components do not achieve this RAO at the FTPA waste pits.	Existing sitewide remedy components do not achieve this RAO at the SWP and NWP.
Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water.	Existing sitewide remedy components do not achieve this RAO at the FTPA waste pits.	Existing sitewide remedy components do not achieve this RAO at the SWP and NWP.
Prevention of offsite migration of landfill solids and soils intermingled with solids into other media.	Existing sitewide remedy components do not achieve this RAO at the FTPA waste pits.	Existing sitewide remedy components do not achieve this RAO at the SWP and NWP.
Protection of human health and the environment from direct contact with or ingestion of leachate that exceeds the performance standards for shallow groundwater and subsurface liquids.	Institutional Controls	Restricts access; Restricts land use to landfilling, monitoring or remediation activities or other uses not inconsistent with the selected remedy, performed under appropriate health and safety plans; Restricts use of groundwater, except for monitoring or remediation purposes.
Prevention of offsite migration of leachate or infiltration into other media.	North Boundary Barrier Wall East/South/West Barrier Wall Surface Water Removal Action MW-38 Groundwater Extraction System	Containment of contaminated groundwater; Separation of contaminated groundwater and surface water.

TABLE 4
SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
FTPA WASTE PIT REMEDY
LOWRY LANDFILL SUPERFUND SITE

CHEMICAL-SPECIFIC ARARS		
Citation	Standard / Requirement	Description and ARAR Determination
FEDERAL CLEAN AIR ACT		
40 CFR Part 61	National Emission Standards for Hazardous Air Pollutants (NESHAPs)	The NESHAPs set forth regulations for emissions of hazardous air pollutants generated from specific manufacturing or industrial processes, for specific chemicals, and for equipment leaks. Requirements governing selected hazardous air pollutants and equipment leaks are applicable to activities that result in emissions of hazardous air pollutants.
COLORADO AIR QUALITY/AIR POLLUTION REGULATIONS		
5 CCR 1001-3 (Regulation No. 1)	Emission Control Regulations	Establishes opacity limits for emissions of regulated air pollutants and, for construction activities resulting in clearance or leveling of more than 5 acres in attainment areas, requires minimization of fugitive particulate emissions. (Pursuant to 5 CCR 1001-14, Denver has been re-designated as an attainment/maintenance area for carbon monoxide, PM_{10}, and ozone.) Applicable to excavation and grading activities at the FTPA waste pits.
5 CCR 1001-4 (Regulation No. 2, Part A)	Odor Emission Regulations	Establishes limits on the emission of odorous air contaminants. Compliance is measured at the property boundary, based on whether odors are detected after the odorous air has been diluted with specified volumes of odor free air. Applicable to activities that result in emissions of odors such as excavation of saturated materials in the FTPA waste pits.
5 CCR 1001-5 (Regulation No. 3)	Air Pollution Emission Notices, Construction Permits and Fees, Operating Permits	Regulation No. 3 sets forth requirements for Air Pollution Emission Notices (APENs) and construction and operating permits. APENs are administrative requirements that are not ARARs for on-site CERCLA remedial action (see EPA/540/G-89/006, *CERCLA Compliance with Other Laws Manual*, Aug. 1988, at p. 1-11). Additionally, pursuant to CERCLA Section 121(e), no permit is required for CERCLA remedial action conducted on-site. However, remedial actions are required to comply with substantive requirements that permits would enforce. Accordingly, substantive provisions implicated by Regulation No. 3 will be evaluated as potential ARARs for any emissions from on-site FTPA remedial activities that would require permits under Regulation No. 3 if conducted offsite.

TABLE 4 (continued)
SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
FTPA WASTE PIT REMEDY
LOWRY LANDFILL SUPERFUND SITE

5 CCR 1001-10 (Regulation No. 8)	Control of Hazardous Air Pollutants	Pursuant to 5 CCR 1001-10 (Regulation No. 8), Part A, Colorado has directly adopted federal regulation 40 CFR Part 61 – National Emissions Standards for Hazardous Air Pollutants (NESHAPs). Requirements governing selected hazardous air pollutants and equipment leaks are applicable to activities that result in emissions of hazardous air pollutants.
ACTION-SPECIFIC ARARS		
FEDERAL RESOURCE CONSERVATION AND RECOVERY ACT (RCRA: SUBTITLE D - SOLID WASTE)		
40 CFR Part 258, Subpart F	Regulations Concerning Closure and Post-Closure Care at Municipal Solid Waste Landfills	Provides standards for closure and post-closure care of municipal solid waste landfill units. Requirements for maintenance of landfill caps are relevant and appropriate to maintenance of the caps at the FTPA waste pits.
COLORADO SOLID WASTE DISPOSAL SITES AND FACILITIES ACT		
6 CCR 1007-2 Sections 2.6 and 3.6	Regulation Pertaining to Solid Waste Disposal Sites and Facilities	Establishes post closure maintenance and care requirements for solid waste disposal facilities. Relevant and appropriate to maintenance of the caps at the FTPA waste pits.
COLORADO HAZARDOUS WASTE ACT/ HAZARDOUS WASTE COMMISSION REGULATIONS		
6 CCR 1007-3 Part 261	Identification and Listing of Hazardous Waste	Establishes criteria for identifying hazardous waste. Applicable to hazardous waste generated during implementation of response action for the FTPA.
6 CCR 1007-3 Part 262	Standards for Hazardous Waste Generators	Provides standards applicable to generators of hazardous waste, including requirements imposed on generators before shipping hazardous waste offsite. Applicable to hazardous waste generated during implementation of response action for the FTPA.
6 CCR 1007-3 Part 265	Standards for Interim Status Hazardous Waste Treatment, Storage and Disposal Facilities	Part 265 is applicable to interim status hazardous waste facilities. The Lowry site is a solid waste (not hazardous waste) facility. Accordingly, the provisions of Part 265 are not applicable; however, based on the nature of wastes found at the FTPA, certain provision of Part 265 (identified below) may be relevant and appropriate to the response action for the FTPA.
6 CCR 1007-3 Part 265, Subparts I and/or J	Use and Management of Containers Tanks	Subparts I and J provide, respectively, standards for storage of hazardous waste in containers and for storage or treatment of hazardous waste in tank systems. Relevant and appropriate if tanks and/or containers are used for storage of hazardous waste generated during implementation of response action from the FTPA.

TABLE 4 (continued)
SUMMARY OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
FTPA WASTE PIT REMEDY
LOWRY LANDFILL SUPERFUND SITE

6 CCR 1007-3 Part 268	Land Disposal Restrictions and Treatment Standards	Establishes prohibitions on land disposal of hazardous wastes unless treatment standards are met or other exceptions apply. Applicable to wastes treated in the onsite treatment cell if the wastes are removed and disposed of outside an area of contamination or offsite.
COLORADO NOISE STANDARDS		
Section 25-12-103	Colorado Noise Abatement Standard	Provides limits for noise based on time periods and zones. Applicable to construction activities.

TABLE 5: COMPARATIVE ANALYSIS OF MODIFIED REMEDY AND ORIGINAL REMEDY FOR THE FTPA WASTE PITS

NCP CRITERION	CAPPING WITH PRODUCT RECOVERY	EXCAVATION/ONSITE TREATMENT
Overall Protection of Human Health and the Environment	• Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill soils, to the saturated zone and groundwater, would be achieved by the engineered cap on the SWP and the NWP. The cap will reduce the infiltration of precipitation to the source material. • Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water, would be achieved by the engineered cap which provides a physical barrier between the surface and the source material. • Prevention of offsite migration of landfill solids and soils intermingled with solids into other media would be achieved by the engineered cap which provides a physical barrier between the surface and the source material. • Other RAOs are achieved by the existing sitewide remedy. • Short-term risks to the public and workers are relatively low. • From a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. The volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the volume of waste pit liquids associated with the waste pits that remain beneath the main landfill mass. • Includes extraction of NAPL and offsite treatment and disposal of extracted liquid. Employs treatment to address principal threat wastes.	• Minimization of the production and migration of leachate, from landfill solids or soils intermingled with landfill soils, to the saturated zone and groundwater, would be achieved by removing the source material through excavation. • Minimization of the migration of soils intermingled with solids, caused by erosion or entrainment by wind or water, would be achieved by removing the source material through excavation. • Prevention of offsite migration of landfill solids and soils intermingled with solids into other media would be achieved by removing the source material through excavation. • Other RAOs are achieved by the existing sitewide remedy components. • Short-term risks to the public and workers are high. • From a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. The volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the volume of waste pit liquids associated with the waste pits that remain beneath the main landfill mass. The volume of waste pit solids associated with the two FTPA waste pits is less than 2.4 percent of the volume of waste pit solids associated with the waste pits that remain beneath the main landfill mass. • Employs treatment to address principal threat wastes.

TABLE 5 (Cont): COMPARATIVE ANALYSIS OF MODIFIED REMEDY AND ORIGINAL REMEDY FOR THE FTPA WASTE PITS

NCP CRITERION	CAPPING WITH PRODUCT RECOVERY	EXCAVATION/ONSITE TREATMENT
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	• Requirements related to construction activities such as requirements for control of fugitive dust in ambient air and noise abatement would be met by employing and dust suppression measures and by establishing controls on the period during which construction may occur. • Requirements related to the characterization, storage, transport, treatment and disposal of solid and liquid wastes would be met by employing proper procedures for characterization and transport and by designing storage to *comply with the requirements.* • Requirements for treatment and disposal would be met by ensuring the offsite disposal facility is in compliance with the requirements.	• Requirements related to construction activities such as requirements for control of hazardous air pollutants, fugitive dust and odor in ambient air and noise abatement would be met by employing emissions control and dust suppression measures and by establishing controls on the period during which construction may occur. • *Requirements related to the characterization, storage, transport, treatment,* and disposal of solid and liquid wastes would be met by employing proper procedures for characterization and transport and by designing storage, treatment and disposal to comply with the requirements. • Requirements for treatment and disposal would be met by ensuring the offsite disposal facility is in compliance with the requirements.
Long-Term Effectiveness and Permanence	• From a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. The volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the volume of waste pit liquids associated with the waste pits that remain beneath the main landfill mass. • Employs treatment to address principal threat wastes from the SWP and the NWP. Does not remove all principal threat wastes, only the recoverable liquids. • Existing sitewide remedy components ensure long term effectiveness and permanence of the remedy by achieving and maintaining RAOs.	• Source material at FTPA will be removed through excavation providing long term effectiveness and permanence at the FTPA. However, residual contamination (including NAPL) will remain outside the source area contributing to sitewide groundwater contamination. • From a sitewide perspective, implementation of this remedy does not change the residual risk at the Site. Although all source material at the FTPA will be removed, the volume of waste pit liquids associated with the two FTPA waste pits is less than 1 percent of the volume of waste pit liquids associated with the waste pits that remain beneath the main landfill mass. The volume of waste pit solids associated with the two FTPA waste pits is less than 2.4 percent of the volume of waste pit solids associated with the waste pits that remain beneath the main landfill mass. • Employs treatment to address principal threat wastes from the SWP and the NWP. • Existing sitewide remedy components ensure long term effectiveness and permanence of the remedy by achieving and maintaining RAOs.
Reduction of Toxicity, Mobility, and Volume (TMV) Through Treatment	• Expected to extract approximately 36,000 to 37,000 gallons of NAPL and approximately 36,000 to 37,000 gallons of groundwater. • NAPL removal is expected to result in removal of approximately 24,000 to 25,000 kg of VOCs from the FTPA.	• Results in TMV reduction through the excavation and treatment of the source material in FTPA waste pits. Approximately 200,000 kg of VOCs will be excavated and either transported off-site for disposal or placed in an on-site treatment cell for further treatment. • Based on the volume excavated, sitewide, over 97 percent of the waste pits solids at the Site will remain in other waste pits after completion.

TABLE 5 (Cont): COMPARATIVE ANALYSIS OF MODIFIED REMEDY AND ORIGINAL REMEDY FOR THE FTPA WASTE PITS

NCP CRITERION	CAPPING WITH PRODUCT RECOVERY	EXCAVATION/ONSITE TREATMENT
Short-Term Effectiveness	• The short-term risk to the community and workers during the implementation of this alternative would be low to moderate. • Work would remain largely onsite. • Risks would be posed to members of the community due to truck traffic associated with transportation of extracted liquids off-site for disposal but these are expected to be low. • Risks would be posed to workers due to the operation of heavy equipment and the potential for contaminant exposures during product recovery activities. • 6 to 7 years to complete.	• There is a potential that ambient air quality would degrade during excavation, thus posing a higher risk to members of the community. The nearest receptor is approximately 1 mile away. Onsite receptors may be closer than 1 mile away. • Slightly higher risks to community from truck traffic associated with transportation of liquids for offsite disposal. • Given the experience in 1998 and 1999 the use of structures over the waste pits during excavation and the installation and operation of large off-gas treatment systems using incineration will be required to mitigate these risks. • Poses much higher risk to workers within the enclosed structure. • 4 to 5 years to complete.
Implementability	• Implementability is expected to be moderate to high. • The capping portion of the remedy is largely in place. Conventional measures would be used to complete the cap. • Administrative implementability is expected to be high. • For offsite treatment and disposal of hazardous wastes, an offsite rule determination for the facility would be required.	• Implementability is expected to be low. • Enclosures would be required at all material handling locations. • Large off-gas treatment systems (36,000 to 60,000 scfm) would be required to treat the off-gas from the enclosures. The systems would likely use incineration. • Electrical upgrades would be required and fuel line installed to each treatment system. • On-site workers within the containment structures would be operating in an OSHA Level B environment requiring personnel protective equipment and supplied air. • Administratively, implementation would involve a high level of effort. The design and implementation of the exposure mitigation strategy would require a high level of detail and review. Offsite rule determination required.
Cost	• The estimated net present worth cost is $887,000. • The estimated capital cost is $393,000. • The estimated yearly operations and maintenance cost is $112,800.	• The estimated net present worth cost is $13,200,000. • The estimated capital cost is $11,600,000. • The estimated yearly operations and maintenance cost is $785,000.
State Acceptance		

TABLE 5 (Cont): COMPARATIVE ANALYSIS OF MODIFIED REMEDY AND ORIGINAL REMEDY FOR THE FTPA WASTE PITS

NCP CRITERION	CAPPING WITH PRODUCT RECOVERY	EXCAVATION/ONSITE TREATMENT
Community Acceptance	• The comments received from the public during the 30 day public comment period for the Proposed Plan for the Former Tire Pile Area were unanimously in support of this remedy.	• No comments in support of Excavation/Onsite Treatment were received from the public.

TABLE 6: SUMMARY OF FORMER TIRE PILE AREA (FTPA) WASTE PITS REMEDY LOWRY LANDFILL SUPERFUND SITE

	Original Remedy Selected In 1994 ROD	1997 Explanation Of Significant Differences	Information Generated After 1994 ROD And 1997 ESD	Selected Modifications To Remedy
Description	Removal of accessible solids through excavation, removal, and treatment, within the former tire pile area, of surface and subsurface drums, contaminated soils, and waste pits and reclamation of the former tire pile area	Excavated materials shall be treated onsite by physical drying/controlled aeration to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act and the Colorado Hazardous Waste Act and shall be disposed of onsite.		The overall remedial approach is changed from excavation to extraction of NAPL from within and immediately outside the north waste pit (NWP) and the south waste pit (SWP) using either top-loading or bottom- loading pumps installed in existing wells; onsite temporary storage of extracted liquids; transportation and offsite treatment and disposal of extracted liquids; maintenance of the existing cap on each waste pit; and groundwater monitoring downgradient of the FTPA waste pits.
Performance Standards	Excavation activities in the former tire pile area shall remove surface and subsurface drums, associated free liquids, and other visible contamination to the extent practicable. This shall include excavation of contaminated materials and soils in the waste pits in the former tire pile area.	No change		Extraction of NAPL shall continue at each well point until the NAPL thickness is less than or equal to 0.5 feet for at period of at least 30 days.

TABLE 6 (Cont): SUMMARY OF FORMER TIRE PILE AREA (FTPA) WASTE PITS REMEDY LOWRY LANDFILL SUPERFUND SITE

	Original Remedy Selected In 1994 ROD	1997 Explanation Of Significant Differences	Information Generated After 1994 ROD And 1997 ESD	Selected Modifications To Remedy
Performance Standards (cont.)	"Visible" contamination shall include stained or discolored materials such as soil, construction debris, woody materials, and refuse; excavation "to the extent practicable" shall include the removal of visible contamination until undisturbed, competent, native bedrock is encountered. The excavations shall be backfilled with clean soils.			
Performance Standards for Treatment, Storage, and Disposal	Contaminated materials in the former tire pile area shall be excavated and characterized for offsite treatment and disposal to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act an the Colorado Hazardous Waste Act.	EPA selected onsite treatment and disposal of contaminated materials excavated from the FTPA waste pits. EPA selected drying/controlled aeration as the method of onsite treatment. In order to dispose of these wastes onsite, the contaminated materials shall be treated to meet RCRA Subtitle C and D requirements of the Solid Waste Disposal Act and the Colorado Hazardous Waste Act.		Recovered liquids shall be characterized for off site treatment and disposal. Hazardous waste shall be identified in accordance with criteria contained in 6 CCR 1007-3 Part 261. Recovered liquids shall be stored on site temporarily. Storage shall meet the requirements of 6 CR 1007-3 Part 265, Subparts I and/or J. Recovered liquids shall be transported offsite for treatment and disposal. Shipment of hazardous waste offsite shall comply with 6 CCR 1007-3 Parts 262 and 263. Recovered liquids shall be shipped to an offsite treatment and disposal facility that complies with 40 CFR 300 Part 440.

TABLE 6 (Cont): SUMMARY OF FORMER TIRE PILE AREA (FTPA) WASTE PITS REMEDY LOWRY LANDFILL SUPERFUND SITE

	Original Remedy Selected In 1994 ROD	1997 Explanation Of Significant Differences	Information Generated After 1994 ROD And 1997 ESD	Selected Modifications To Remedy
Scope of drum and liquid removal	It is estimated there are approximately 10 surface and 1,350 buried drums containing approximately 1,300 gallons of liquid waste in the area.	No change	187 drums and 300-400 cubic yards of drum carcasses were excavated from the middle waste pit (MWP) and NWP between 1998 and 1999. No estimates are available for the number of additional drums in the SWP and NWP. For feasibility study cost estimating purposes, it was assumed that an additional 1000 drums and 500 cubic yards of drum carcasses remain in the SWP and the NWP.[1] 80,000 gallons of liquid were removed from the MWP and disposed offsite.[2] 189,000 gallons of liquid were removed from the SWP and disposed offsite.[3] Current estimates of waste pit liquid are 545,000 gallons in the SWP and 384,000 gallons in the NWP.[1] Current estimates of NAPL are 11,000 gallons in the SWP and 121,000 gallons in the NWP.[1]	NAPL extraction shall continue until performance standards are achieved.
Scope of removal of contaminated soil and debris	It is estimated that there are approximately 15,000 cubic yards of contaminated soil and debris in the FTPA.	No Change	14,236 cubic yards of contaminated material were removed from the MWP. Current estimates of contaminated soil and debris are 18,100 cubic yards in the SWP and 11,800 CY in the NWP.[1]	No excavation

TABLE 6 (Cont): SUMMARY OF FORMER TIRE PILE AREA (FTPA) WASTE PITS REMEDY LOWRY LANDFILL SUPERFUND SITE

	Original Remedy Selected In 1994 ROD	1997 Explanation Of Significant Differences	Information Generated After 1994 ROD And 1997 ESD	Selected Modifications To Remedy
Short Term Risks	Short term risks to workers and the community are slightly higher than other alternatives considered. Increases in organic emissions and possibly inorganic emissions are anticipated as a result of excavation of buried drums and contaminated soils. Emissions would be controlled using appropriate dust suppression methods that may include the use of water, foam or cover materials such as PVC sheeting.	No Change	Prior to excavating into the NWP, a large sprung structure was constructed over the area to be excavated. The sprung structure was the method selected to contain air emissions. A ventilation and off-gas treatment system consisting of a 12,000 cubic feet per minute blower and twin banks of activated carbon were attached to the structure to treat ventilated air. When excavation began in May 1999, the amount and toxicity of vapors produced were not expected and overwhelmed the ventilation and off-gas treatment system. Conditions became dangerous to workers. The current conceptual design of emission controls required during excavation includes construction of enclosures over each waste pit, over the treatment cell during blending operations, and over the decontamination area. Each enclosure would require ventilation/off-gas treatment systems that could process 36,000 – 60,000 cubic feet per minute of vapor. Off-gas would be treated with a large thermal oxidizer/incinerator.[1]	The short-term risk to the community and workers during implementation would be low to moderate. Work would remain largely onsite. Risks would be posed to members of the community due to truck traffic associated with transportation of extracted liquids offsite for disposal, but these risks are low. Risks would be posed to onsite workers due to the operation of heavy equipment and the potential for exposure to contaminants during product recovery activities.

TABLE 6 (Cont): SUMMARY OF FORMER TIRE PILE AREA (FTPA) WASTE PITS REMEDY LOWRY LANDFILL SUPERFUND SITE

	Original Remedy Selected In 1994 ROD	1997 Explanation Of Significant Differences	Information Generated After 1994 ROD And 1997 ESD	Selected Modifications To Remedy
Net Present Worth Cost	Estimated net present worth cost of FTPA remedy is $12.1 million.		The total capital cost of excavation of the MWP and performing a pilot scale study at the SWP is approximately $13 million. The estimated net present worth cost of excavating the remaining two waste pits is $13.2 million.[1] Total cost (actual cost of MWP excavation and SWP pilot study + estimated cost of excavation of NWP and SWP) is $26.2 million	Estimated net present worth cost of selected remedy for the NWP and the SWP is $887,000.[1]

[1] Final Feasibility Study, FTPA Waste Pit Remedy, Lowry Landfill Superfund Site Remedial Action, prepared by Parsons, December 30, 2004.
[2] Interim Closeout Report, Middle FTPA Waste Pit Remediation and Construction of the Treatment Cell, prepared by Parsons, October 15, 1999.
[3] South Waste Pit Pilot Study Closeout Report, prepared by Parsons, June 6, 2003.